



T e x a s   N a t u r a l   R e s o u r c e   C o n s e r v a t i o n   C o m m i s s i o n

April 1997




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Published and distributed by the  
Texas Natural Resource Conservation Commission  
Post Office Box 13087  
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# FOREWORD

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As required in Sections 361.020 and 361.0201 of the Texas Health and Safety Code, this report updates the main information provided in the *Municipal Solid Waste Plan for Texas* (SFR-17), published by the Texas Natural Resource Conservation Commission (TNRCC) in January 1995. A strategic planning document has also been prepared, as a companion to this status report, and will be published in early 1997. Together, these two documents will fulfill applicable legislative requirements.

For much of this report, the most current data presented are for 1994, although some data for 1995 and 1996 are provided. This circumstance is largely due to the fact that the collection of data from permitted facilities is done annually, with reporting

forms not sent out until after the reporting year is concluded. Then, several months are required to achieve a 100 percent data return, and to verify, enter, and evaluate all of the collected data. At the time this report was produced, 1995 annual report data had not been thoroughly evaluated, and annual report forms for 1996 had not yet been sent out.

Questions concerning this report, as well as requests for additional information on the management of solid waste in the state, may be directed to the Waste Planning and Assessment Division of the TNRCC at (512) 239-6809.

To obtain additional copies of this report, as well as the strategic plan, please contact the TNRCC Publications Section at (512) 239-0028.

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# INTRODUCTION

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## BACKGROUND

The Texas Solid Waste Disposal Act (TSWDA), codified in Chapter 361 of the Texas Health and Safety Code, directs the Texas Natural Resource Conservation Commission (TNRCC) to prepare a “Comprehensive Municipal Solid Waste Management Strategic Plan” for the state. The TSWDA further directs that the TNRCC update the plan every two years.

In January 1995, the TNRCC published the *Municipal Solid Waste Plan for Texas* to fulfill the statutory planning requirements. The plan provided an overview of municipal solid waste (MSW) management in Texas, and outlined existing and potential future needs of the state. It also included goals, objectives, and recommendations to help guide MSW management activities in the state.

In providing this required update, the TNRCC is departing from the previous planning format by publishing two separate documents. This status report contains updated information concerning the status of MSW management activities in the state. An MSW strategic plan, outlining the planning goals, objectives, and strategic recommendations for MSW management in the state, will be published separately.

## PURPOSE AND SCOPE

This report is intended to satisfy the informational component of the MSW planning requirements in the TSWDA; it

is *not* intended to be a complete reference document. More detailed information about specific regions, localities, or individual solid waste facilities may be obtained through the 24 councils of governments (COGs) in the state, which are responsible for developing and maintaining regional solid waste management plans.

In addition to the planning requirements, the TSWDA (§361.034, Texas Health and Safety Code) also directs the TNRCC to provide a report to the governor and the legislature on several state programs dealing with MSW. This status report is intended to also satisfy these additional reporting requirements:

- progress made and activities consistent with the comprehensive solid waste management strategic plan, including achievement of the waste reduction goals;
- evaluation of progress made by local governments under their solid waste management plans;
- status of state procurement of products made from recycled materials (program required under §361.426, Texas Health and Safety Code);
- status of recycling programs of governmental entities (programs required under §361.425, Texas Health and Safety Code);
- status of public education programs (established under §361.0202, Texas Health and Safety Code).

## **FACTORS AFFECTING MSW MANAGEMENT IN TEXAS**

### **PHYSICAL AND SOCIOECONOMIC FACTORS AFFECTING MSW MANAGEMENT IN TEXAS**

A number of major factors, and changes to those factors, have a direct effect on the management of MSW in Texas. Some of these factors include the physical size and location of Texas, as well as the level and growth of the state's population and economy.

#### ***Physical Size***

Texas is the second-largest state in the nation, covering 267,338 square miles. With 254 counties, and numerous incorporated and unincorporated cities and districts, the large physical size of Texas presents challenges to statewide planning and implementation efforts.



#### ***Location***

Texas borders four states, as well as the Republic of Mexico; consequently, its geopolitical location has significant implications to both interstate and international solid waste management issues. Texas also has an extensive coastline along the Gulf of Mexico, with a number of major ports, and the related shipping, industry, and tourism present special solid waste management needs.

#### ***Climate***

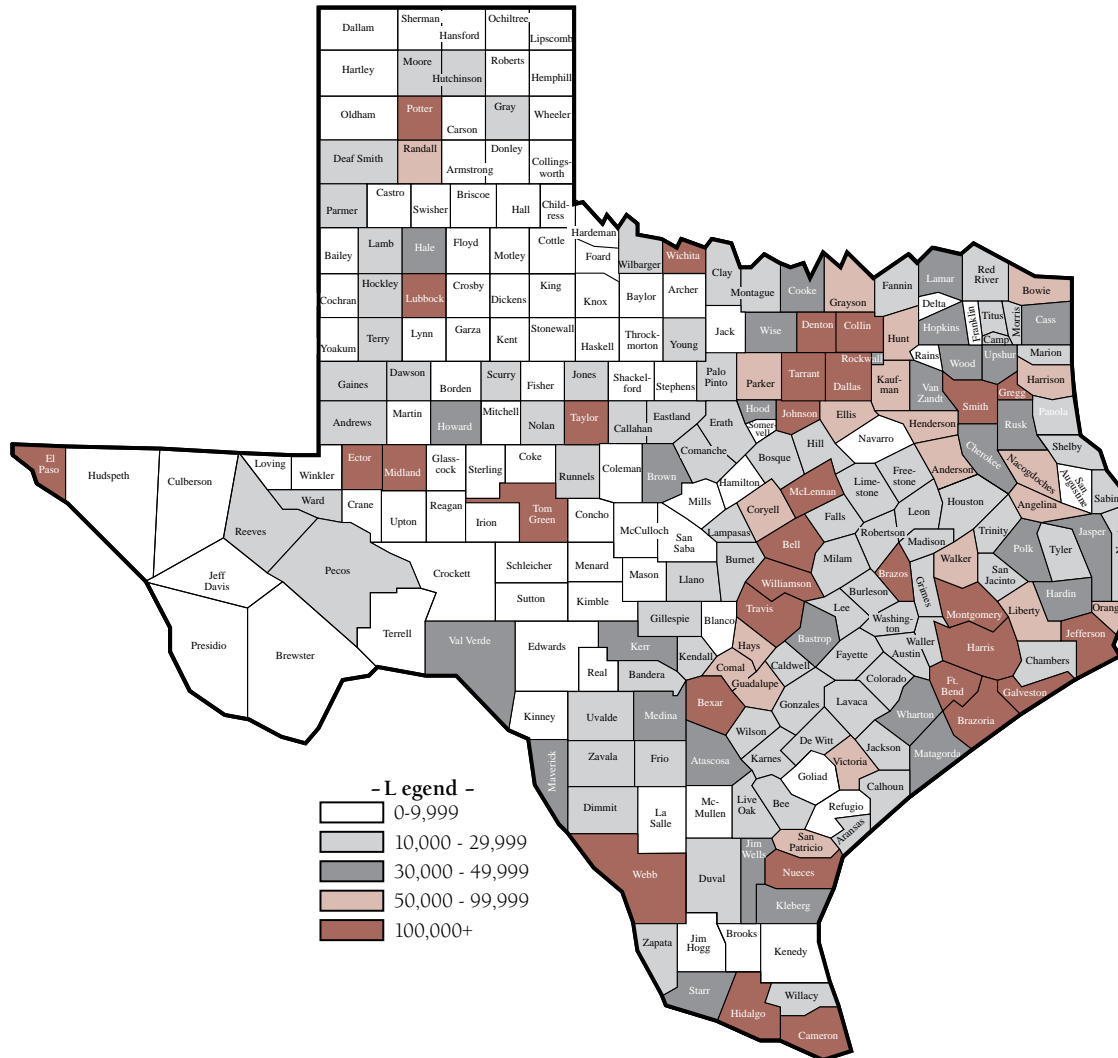
Texas has a wide range of climatic conditions, with average annual precipitation ranging from 56 inches in the eastern part of the state to less than 10 inches in the far western part. In addition, many areas of the state are subject to seasonal outbreaks of violent weather, which may result in emergency solid waste management needs.

#### ***Population***

According to the national census, the population of Texas grew from 14,229,191 in 1980 to 16,986,510 in 1990, an increase of greater than 19 percent. The latest estimates from the Texas State Data Center at Texas A&M University put the 1994 population at 18,378,185; by the year 2000, the state population is projected to exceed 20 million. This population is unevenly distributed across the state, as illustrated in Figure 1, with many parts of the state still remaining sparsely populated and even isolated, making solid waste management a particular concern.

Figure 1

Population Distribution in Texas by County, 1994



Source: Derived from population estimates from the Texas State Data Center.

### ***Economy***

Compared to other states, Texas ranks second in total number of industries, and has the third-highest gross state product. The Texas Comptroller of Public Accounts forecasts that the overall economy of the state will continue to grow. This has broad implications to the generation of commercial, nonhazardous industrial, and construction and demolition (C&D) waste, and the need to maintain adequate capacity to handle these significant components of the state's solid waste stream.

## **MAJOR FEDERAL AND STATE LEGISLATION AFFECTING MSW MANAGEMENT**

### ***Federal Resource Conservation and Recovery Act (RCRA)***

The RCRA, which amended the federal Solid Waste Disposal Act, addresses numerous aspects of solid waste management. Subtitle D of the RCRA has had significant impacts on MSW management nationwide, as the recent amendments increased the stringency of standards and requirements for the design, construction, operation, monitoring, and closure of MSW landfills.

### ***Federal Clean Air Act***

The Clean Air Act may apply to certain solid waste management activities, such as landfill gas emissions and the control of incinerator particulate emissions.

### ***Texas Solid Waste Disposal Act (TSWDA)***

The TSWDA establishes the principal requirements for solid waste management facilities and operations in the state, and assigns responsibility to the TNRCC to administer statewide solid waste management permitting and control functions.

### ***Comprehensive Municipal Solid Waste Management, Resource Recovery, and Conservation Act***

This act provides for waste reduction efforts and solid waste management planning at the state, regional, and local levels.

## **ENTITIES INVOLVED IN THE MANAGEMENT OF MSW IN TEXAS**

### ***Federal***

The U.S. Environmental Protection Agency is the primary federal entity responsible for adopting regulations, criteria, and standards to carry out the requirements of the RCRA concerning the management of solid waste.

### ***State***

The TNRCC is the lead agency for administering the state solid waste management programs, including adopting and implementing regulations that comply with the federal requirements. In addition, there are a number of



other state agencies involved in various aspects of solid waste management, particularly programs for litter abatement and source reduction and recycling, including the Texas General Land Office, Texas Department of Transportation, Texas General Services Commission, and the Texas Department of Commerce.

### ***Regional***

The state's 24 councils of governments (COGs) are designated as the regional solid waste management planning entities, and are responsible for regional solid waste planning and coordination. Various regional districts and authorities, such as the state's river authorities, also have solid waste management authority and responsibilities.

### ***Local***

The 254 counties and numerous incorporated and unincorporated cities, as well as local districts, nonprofit entities, and private companies, are also involved in some or all aspects of providing solid waste management services.



# ANALYSIS OF THE MSW STREAM

## SOURCES OF MSW

MSW typically comes from residential, commercial, recreational, and institutional sources. The MSW stream also often contains significant amounts of C&D debris and brush from the clearing of land. In addition, the MSW stream may contain certain other wastes, such as wastewater treatment plant sludge, septic tank pumpage, dead animals and slaughterhouse waste, medical waste, grease and grit trap waste, asbestos, and incinerator ash. Some MSW facilities are also permitted to accept nonhazardous waste from industrial

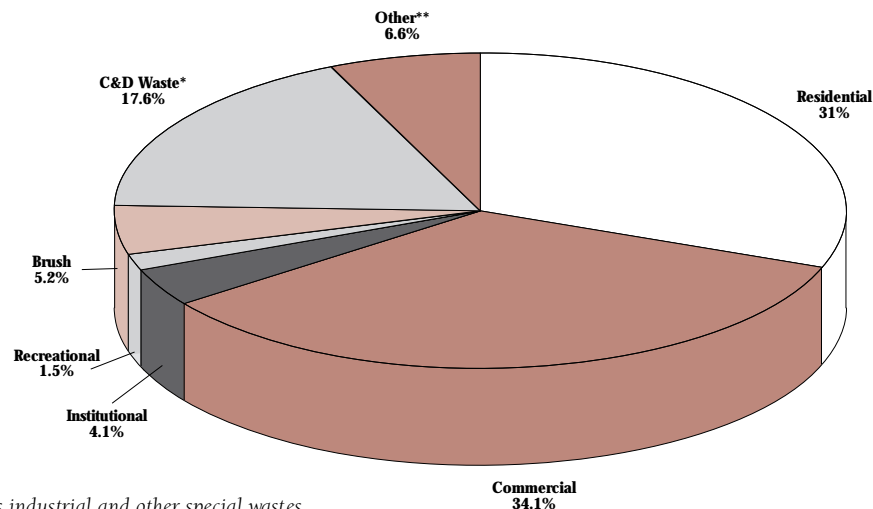
sources, although this type of waste is not included in the regulatory definition of MSW.

(See Figure 2.)

The fact that approximately equal percentages of waste come from residential and commercial sources has important implications to the direction of waste reduction efforts in the state. Furthermore, the relatively large percentage of C&D debris, which should be expected to remain significant in light of the state's growing economy, provides yet another important target for waste reduction efforts.

**Figure 2**

***Waste Disposal by Source in  
MSW Landfills in Texas, 1994***



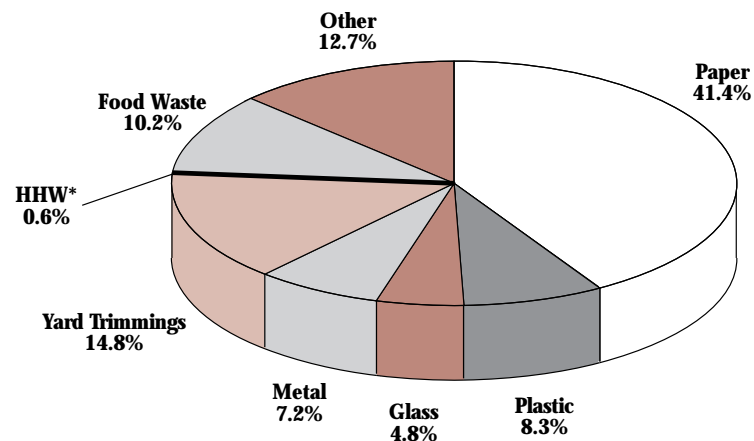
Source: TNRCC annual MSW facility reports.

\*Construction and demolition debris. \*\*Includes industrial and other special wastes.

## COMPONENTS OF THE MSW STREAM

Relatively few detailed waste characterization studies have been conducted across the country. However, a state-wide recycling rate and market research study prepared by R.W. Beck and Associates in 1991 has provided estimates on the composition of the MSW stream in Texas. As shown in Figure 3, the largest single component of the MSW stream in Texas is paper, although yard trimmings are another significant component. Therefore, targeting these particular components in waste reduction efforts would have the greatest impact on the MSW stream. The percentages in Figure 3 compare closely to those estimated by the EPA on a national basis.<sup>1</sup>

**Figure 3**  
*Components of the MSW Stream in Texas, 1991*



Source: R.W. Beck and Associates, 1991 Recycling Rate and Market Research (Austin: Texas Water Commission, January 1993). \* Household hazardous waste.

## MSW GENERATION

The terms “generation” and “disposal” are often used interchangeably, even though they have quite different meanings. “Disposal” specifically refers to landfilling; however, “generation” more broadly refers to all solid waste, created through various activities, that enters the solid waste stream, with final disposal being just one element of total generation. Generation can generally be estimated with the following basic formula:

$$\text{Generation} = \text{Disposal} + \text{Combustion} + \text{Diversion for Recycling/Composting} + \text{Net Exports}^*$$

$$^*\text{Net Exports} = \text{Exports} - \text{Imports}$$

Without a reliable estimate of the recycling rate, the TNRCC has not attempted to estimate the rate of generation of MSW in the state. The per capita solid waste disposal rate of 6.5 pounds per person per day provides some indication of the level of waste generation, not considering the amount of waste being diverted from the waste stream due to recycling and composting. It should also be noted, however, that this disposal rate includes the solid waste received from all sources of waste entering the waste stream, and not just the typical municipal-waste-generating sectors.

<sup>1</sup>U.S. Environmental Protection Agency, Characterization of Municipal Solid Waste in the United States: 1995 Update, Executive Summary (Washington: USEPA, March 1996).

**Table 1**

***Solid Waste Generation in Texas, 1994***

|   | Disposal   | Combustion | Diversion for Recycling | Net Exports | Total      |
|---|------------|------------|-------------------------|-------------|------------|
| <b>Tons</b>                               | 21,808,274 | 50,361     | undetermined            | 0           | 21,858,635 |
| <b>Per capita rate</b><br>(lb/person/day) | 6.502      | 0.015      | undetermined            | 0           | 6.517      |

Source: TNRCC annual MSW facility reports.

- Disposal—In 1994, 21,808,274 tons of solid waste were disposed of in MSW landfills in Texas.
- Combustion—Solid waste combustion includes basic incineration as well as waste-to-energy conversion. In 1994, 50,361 tons of solid waste were received by these facilities.
- Recycling (including composting)—Recyclers are not required to report on their activities, and the TNRCC has no reliable measurement of the current level of recycling in the state. The agency is currently working with the Recycling Coalition of Texas, the Texas Association of Regional Councils, and private sector recyclers to explore voluntary options for addressing this issue.
- Imports and Exports—In 1994, permitted MSW facilities in Texas received only 129,385 tons of waste from other states, including Arkansas, Louisiana, New Jersey, New Mexico, and Oklahoma. An additional 5,772 tons of waste were imported from Mexico. Although no data are available on the amount of MSW exported from Texas to other states, this amount is assumed to be relatively small, resulting in no net imports or exports.



# MSW MANAGEMENT IN TEXAS

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## COLLECTION AND TRANSFER

### RESIDENTIAL AND COMMERCIAL COLLECTION

In many Texas communities, curbside or alleyway collection on a biweekly or weekly basis is the common approach used to provide residential collection services. In more rural areas, individual collection services may be provided on a less frequent basis. According to information gathered by the state's 24 COGs, the typical residential curbside collection charges in Texas range from \$8 to \$15 per month.

Collection of commercial solid waste in Texas is often provided by private companies under contract, although a number of local governments also provide commercial waste collection along with residential services. The charges for commercial solid waste collection appear to vary widely across the state, with figures reported by several COGs ranging from \$17 to \$136 per month, depending upon the size of collection containers, location, and frequency of collection.

### CITIZENS' COLLECTION STATIONS

As a result of the large number of landfill closures in Texas in recent years related to more stringent federal regulations, many communities now face the need to provide more complete MSW collection services to their residents who find themselves without a nearby disposal facility. In some cases,

"citizens' collection stations" may offer a practical and cost-effective alternative to individual collection services. A citizens' collection station is a facility established for the convenience and exclusive use of household residents, and may consist of one or more storage containers, bins, or trailers. These facilities are not required to be registered with or permitted by the TNRCC. Therefore, only limited information is available concerning the extent to which these facilities are used in Texas. However, recent information from the 24 COGs indicates that there may be 100 to 150 or more citizens' collection stations operating in the state. Some citizens' collection stations do not require a charge for use, and some are unstaffed. For those citizens' collection stations that have a charge for use, charges appear to be comparable to those for residential curbside services.



### TRANSFER STATIONS

Another mechanism for reducing the costs associated with collecting and transporting solid waste is the use of transfer stations. State regulations define a transfer station as a fixed facility used for transferring solid waste from collection vehicles to long-haul vehicles. In the past, all transfer stations had to obtain a permit from the TNRCC. However,

recent changes to state regulations allow for certain transfer stations to operate under a registration rather than a permit, making the transfer station approach more feasible to smaller and more rural areas. Consequently, while the number of permitted transfer facilities has remained stable at around 40, as of early 1996, there were an additional 99 registered transfer stations operating in the state.

## WASTE REDUCTION

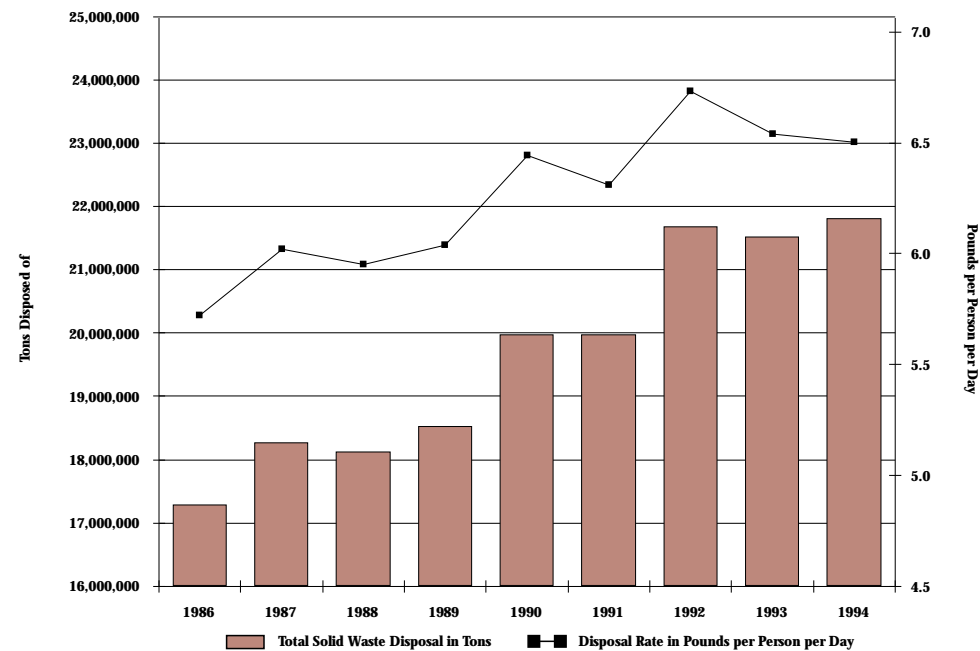
### PROGRESS TOWARD WASTE REDUCTION GOALS

#### *State Goal<sup>1</sup>*

“Reduce the amount of waste disposed of in MSW landfills by 40 percent, using 1992 landfill disposal tonnages as a base, and accounting for changes in population, import and export of solid waste, and other factors.”

**Figure 4**

**Total Disposal and Per Capita Disposal Rates in Texas, 1986–1994**



<sup>1</sup>The original goal was established by the Legislature in 1991 to achieve a 40 percent recycling rate by 1994. That goal was changed in 1993 to a 40 percent reduction in the amount of waste entering the state's MSW landfills. The State MSW Strategic Plan (MUNICIPAL SOLID WASTE MANAGEMENT IN TEXAS—Strategic Plan) updates that legislative goal. See Appendix A for a more complete discussion of the state's waste reduction goal.

Sources: Disposal data from TNRCC annual MSW facility reports. Per capita disposal rates were derived using population estimates from the Texas State Data Center.



In 1994, permitted MSW landfills reported that 21,808,274 tons of waste were disposed of in Texas. With an estimated population of 18,378,185, the per capita disposal rate for 1994 was about 6.5 pounds per day (about a 3.5 percent reduction from the 1992 per capita rate). After a steady rise between 1986 and 1992, it appears that total disposal is beginning to level off at between 21 and 22 million tons per year, and that the per capita disposal rate is beginning to show a decreasing trend. From this information, it can be assumed that waste reduction programs initiated in the early 1990s are beginning to show positive results, and that continuing waste reduction efforts will support this trend.

It must also be noted that Texas primarily relies on voluntary measures to try to achieve its waste reduction goals. If waste reduction measures continue at a moderate pace, as they are now, a 20 percent reduction in per capita disposal may be attained by the year 2000. Appendix C presents several waste reduction scenarios to show the effect that certain levels of waste reduction would have on the state's disposal amounts and landfill capacity.

It is obvious that total disposal amounts and per capita disposal rates serve as important barometers for the success of waste reduction efforts in Texas. However, in 1994, only about 25 percent of the MSW landfills in the state had scales, with the majority of facilities relying on various estimation methods to derive equivalent tonnages. Therefore, it is important to note that there could be a considerable variance between the per capita disposal rates presented in Figure 4, which are largely based on estimated disposal amounts, and rates based largely on actual scale weight.

## **SOURCE REDUCTION AND RECYCLING ACTIVITIES**

The levels of source reduction and recycling activities in the state continue to increase substantially.

The TNRCC administers a variety of solid waste reduction programs, as do several other state agencies, ranging from direct assistance to communities and businesses, to development of educational and informational materials. A more detailed description of these programs is provided in Appendix B.

Although collection and processing problems may arise in some areas of the state, the overall capacity of end users to accept recyclable materials is not in question, but the state of regional and local markets may be less stable. A more detailed recycling market analysis is provided in Appendix C.



## ***Recycling Activity in Texas***

- Private and Nonprofit Operations—The *Recycle Texas Directory* (GI-224), maintained by the TNRCC, currently lists 238 private and nonprofit operations that provide some sort of recycling or composting service.
- Community Recycling—Based on a community recycling survey conducted by the TNRCC at the end of 1995, it is clear that the number of recycling and composting activities operated by local governments continues to grow:
  - At least 130 cities now provide curbside recycling services to 1.5 million households (estimated to be one-third of the single-family and duplex households in the state, and representing about 3.5 million people).
  - Twenty-six cities provide recycling services to multifamily households.
  - More than 100 cities have both recycling drop-off centers and centralized collection of yard trimmings.
- Recycling Industry in Texas—According to a recent survey conducted by the TNRCC, the recycling industry accounts for more than 20,000 private-sector jobs in Texas. In addition, a recent draft report prepared for the Southern States Waste Management Coalition shows that the value recycling adds to the Texas economy annually is more than \$2.8 billion.<sup>1</sup>
- Texans' Attitudes towards Recycling—In 1993, and again in 1995, the TNRCC commissioned a survey by NuStats, Inc., to assess the "greenness" of Texans. Specifically in response to questions about solid waste management,



the majority of those surveyed said they supported various efforts to reduce waste, and 75 percent were willing to pay an additional dollar or two each month for recycling services, as long as they were convenient and did not require too much time. This would tend to favor the continued implementation of voluntary curbside recycling programs around the state.

<sup>1</sup>Roy F. Weston, Inc., "Economic Benefits of Recycling in the Southern States," a draft report prepared for the Southern States Waste Management Coalition (July 1996).

## LANDFILL DISPOSAL

### FACILITIES AND CAPACITY

Table 2

*Data Related to Disposal Capacity in Texas, 1986–1994*

| Year | Total Waste Disposal (Tons) | Open Landfills |          | Remaining Capacity |             |       |
|------|-----------------------------|----------------|----------|--------------------|-------------|-------|
|      |                             | Active         | Inactive | Cubic Yards        | Tons        | Years |
| 1986 | 17,283,977                  | 790            | 94       | 1,194,118,393      | 388,088,478 | 22.5  |
| 1987 | 18,269,917                  | 763            | 104      | 1,188,680,680      | 386,301,221 | 21.1  |
| 1988 | 18,114,295                  | 750            | 84       | 1,162,374,628      | 377,771,754 | 20.9  |
| 1989 | 18,531,001                  | 616            | 83       | 1,111,902,033      | 361,368,161 | 19.5  |
| 1990 | 19,969,615                  | 493            | 142      | 1,124,524,795      | 393,583,678 | 19.7  |
| 1991 | 19,973,622                  | 405            | 135      | 1,183,699,041      | 414,294,664 | 20.7  |
| 1992 | 21,675,661                  | 343            | 77       | 1,193,233,770      | 440,730,048 | 20.3  |
| 1993 | 21,517,063                  | 289            | 62       | 1,205,635,627      | 456,161,796 | 21.2  |
| 1994 | 21,808,274                  | 199            | 58       | 1,269,565,453      | 483,752,986 | 22.2  |

Source: TNRCC annual MSW facility reports.

On October 9, 1991, the EPA published amended rules governing MSW landfills in response to directives contained in Subtitle D of the RCRA. These amendments substantially changed how MSW landfills are designed, constructed, operated, closed, and monitored. Texas has subsequently amended its MSW rules to comply with the federal requirements.

With the implementation of Subtitle D requirements, there are now only two types of MSW landfills in Texas,

Type I and Type IV. Type I landfills are the standard facilities for the disposal of MSW. Waste deposited in Type I landfills must be compacted and covered at least daily. The TNRCC may also authorize the disposal of certain special wastes and industrial nonhazardous waste in Type I landfills. In 1994, there were 217 Type I landfills open in Texas.

Type IV landfills may only accept C&D debris, brush, and other nonputrescible materials. Waste deposited in

Type IV landfills must be compacted and covered at least weekly, unless otherwise specified by the TNRCC. In 1994, there were 40 Type IV landfills open in Texas.

Certain landfills may be eligible for an “arid exempt” (i.e., Type I-AE or Type IV-AE) designation, exempting them from some of the new Subtitle D requirements. To become “arid exempt,” a landfill must be located in an area receiving less than 25 inches of average annual precipitation and must accept less than 20 tons of solid waste per day, based on an annual average. In addition, there must be no existing

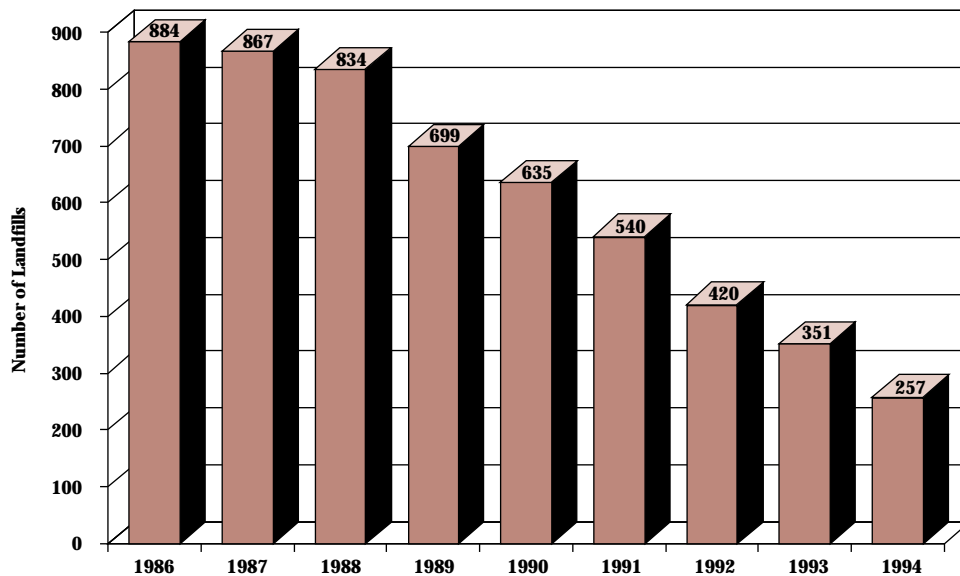
evidence of groundwater contamination, and the landfill must serve a community that has no other practicable waste management option. By early 1996, almost 90 landfills had received “arid exempt” status.

At the end of 1994, 257 landfills were open in Texas. However, based on quarterly disposal fee reports to TNRCC, this number had dropped to 224 by 1996. Figure 5 illustrates the dramatic drop in the number of MSW landfills open in Texas between 1986 and 1994, largely attributable to the implementation of Subtitle D regulations.

Despite the large number of landfill closures in Texas in recent years, overall disposal capacity in the state has fluctuated relatively little. This is primarily due to the fact that most of the landfill closures involved smaller facilities, with new facilities and expansions of existing facilities generally keeping up with losses in capacity. In addition, improvements in technology have resulted in greater compaction rates, extending the life of many landfills. Appendix D provides some more detailed scenarios for future disposal capacity.

Although Texas has a sizeable reserve of disposal capacity, this capacity is not spread equally among all regions of the state. While four of the COGs have twice the statewide average disposal capacity, three have less than half of the statewide average. Of the 254 counties in Texas, in 1994 only 154 had at least one landfill (by comparison, in 1986, 250 counties had at least one landfill). This has a significant implication to solid waste collection, storage, and transportation needs in many parts of the state. Appendix E provides more detailed regional and county disposal information.

**Figure 5**  
***Number of Open MSW Landfills in Texas, 1986–1994***



Source: TNRCC annual MSW facility reports.

## DISPOSAL COSTS

As could be expected, landfill disposal tipping fees in Texas have been rising recently. Of the 257 MSW landfills open at the end of 1994, 49 reported charging a per ton tipping fee, averaging \$28.56. This represents almost a 70 percent increase over the average tipping fees charged in 1992 by those landfills reported to charge on a per ton basis. A greater number of landfills (186) reported charging tipping fees on a per cubic yard basis, averaging \$6.02 in 1994.

As indicated in Table 3, the tipping fees charged in Texas are consistent with those in other states in the south central region of the United States, with an average tipping fee of \$20.30 charged in 1995. The average in this region is the lowest in the nation, with the northeastern states reporting the highest average tipping fee, \$73.17 per ton in 1995.



**Table 3**

***Landfill Tipping Fees in the United States (\$/Ton)***

| Region           | 1985  | 1986  | 1987  | 1988  | 1990  | 1992  | 1995  |
|------------------|-------|-------|-------|-------|-------|-------|-------|
| Northeast        | 12.66 | 17.11 | 52.41 | 61.11 | 64.76 | 65.83 | 73.17 |
| Mid-Atlantic     | 16.99 | 22.08 | 26.32 | 33.84 | 40.75 | 47.94 | 45.68 |
| South            | 3.24  | 5.76  | 13.13 | 16.46 | 16.92 | 22.48 | 28.50 |
| Midwest          | 7.23  | 11.75 | 16.42 | 17.70 | 23.15 | 27.10 | 31.15 |
| South Central    | 7.24  | 7.61  | 10.17 | 11.28 | 12.05 | 12.53 | 20.30 |
| West Central     | 5.36  | 6.21  | 7.23  | 8.50  | 11.06 | 12.62 | 23.29 |
| West             | 10.96 | 11.10 | 13.92 | 19.45 | 25.63 | 27.92 | 37.69 |
| National Average | 8.20  | 10.82 | 16.11 | 19.12 | 23.01 | 26.32 | 32.19 |

Source: Edward W. Repa and Allen Blakey, "Municipal Solid Waste Disposal Trends—1996 Update," Waste Age, May 1996, 180.

Regions: Northeast: (Conn., Mass., Maine, N.H., N.Y., R.I., Vt.)

South Central: (Ariz., Ark., La., N.M., Okla., Texas)

Mid-Atlantic: (Del., Md., N.J., Pa., Va., W.Va.)

West Central: (Colo., Kan., Mont., Neb., N.D., S.D., Utah, Wyo.)

South: (Ala., Fla., Ga., Ky., Miss., N.C., S.C., Tenn.)

West: (Alaska, Calif., Hawaii, Idaho, Nev., Ore., Wash.)

Midwest: (Ill., Ind., Iowa, Mich., Minn., Mo., Ohio, Wis.)

## OTHER MSW MANAGEMENT METHODS

### MATERIALS RECOVERY

Materials recovery facilities (MRFs) remove various materials from the MSW stream for recycling and other beneficial use. There are about 70 MRFs in Texas, many of which are beginning to expand their operations. However,

only those MRFs that handle the entire MSW stream are required to have a permit. In 1994, there were only three permitted mixed-waste recovery facilities (Type V-RR) in the state, all of which were inactive and handled no waste. Mixed-waste recovery facilities often meet with local resistance, due to concerns over odors, disease vectors, noise, and heavy-vehicle traffic. Due to this, as well as economic reasons, many MRF operators handle only certain components of the MSW stream.

### COMBUSTION

Combustion includes basic incineration as well as waste-to-energy (WTE) conversion. There are numerous combustion facilities across the state, located in hospitals, schools, police stations, prisons, and private businesses. Although these facilities must comply with appropriate air control regulations,

they are not required to have an MSW permit. Only those combustion facilities handling entire community or regional waste flows are required to have an MSW permit. In 1994, there were 17 permitted MSW incineration facilities (Type V-WI) in Texas, only eight of which were active, handling a total of 19,717 tons of waste; there were three WTE facilities (Type V-RE) in the state, all of which were active, handling a total of 30,644 tons of waste. Combustion of solid waste on the community or regional scale has not been widely practiced in Texas to date. Whereas large-scale combustion facilities have been more feasible in other parts of the country, they have generally not proven cost-effective in Texas. In addition, controversial flow control issues may be involved in successfully operating such facilities. Further, as a result of recent federal regulations, residual ash may in some cases be considered hazardous waste, requiring much more expensive handling.

### LIQUID WASTE PROCESSING

Due to Subtitle D requirements, liquid wastes such as sludge, septage, and grease and grit trap wastes must be solidified and stabilized in order to be disposed of in MSW landfills. Consequently, there has been a growing demand in recent years for permitted liquid waste processing facilities (Type V-GG) in the state, and the TNRCC has worked to streamline the permitting process for these facilities. In 1994, there were 11 Type V-GG facilities in the state, six of which were active, handling a total of 136,409 tons of liquid waste. To further facilitate meeting the demand for liquid waste processing in the state, the TNRCC has also recently authorized a number of Type I MSW landfills to process liquid





wastes on-site. The number of processing facilities, however, is still not at the level needed to meet the demand, and it is expected that many areas of the state are still lacking sufficient alternatives for dealing with liquid wastes.

### **LAND APPLICATION OF SLUDGE**

Although 467,348 tons of sludge were disposed of in MSW landfills in 1994, this practice has become much less cost-effective in many areas of the state due to the added costs of liquid waste processing. Consequently, there has been a significant increase in the number of registered sludge land-application sites in the state. In 1995, there were 456 registered sites land-applying a total of 138,557 tons of sludge; by comparison, there were only 141 active sites in 1991. This movement toward land application of sludge is expected to continue.

### **CO-COMPOSTING AND MIXED-WASTE COMPOSTING**

In addition to land application, co-composting (i.e., mixing sludge with vegetative material) has become a more attractive alternative to landfilling sludge in many areas of the state. To facilitate the growing interest in co-composting in the state, the TNRCC recently allowed for registration rather than permitting of co-composting facilities. Now, only those composting facilities handling the entire MSW stream (Type V-RC) are required to have an MSW permit. In 1994, there were two mixed-waste composting facilities permitted in the state, only one of which was active, handling a total of 144 tons of waste.

### **REFUSE-DERIVED FUEL**

Certain components of the MSW stream can be diverted from landfilling and processed into fuel pellets, known as refuse-derived fuel (RDF). Although this technology continues to be of interest, it has not been devel-



oped to any great extent in Texas, where other power sources are more cost-effective and readily available. In 1994, there were two permitted RDF facilities (Type V-RF) in the state, only one of which was active, handling a total of 1,340 tons of waste.

### **RECOVERY OF METHANE FROM LANDFILLS**

Closed landfill sites, as well as closed portions of active landfills, can be “mined” for methane gas, which can be used for fuel. Although several MSW landfills in Texas are permitted to recover methane gas, there are currently only three active recovery operations in the state. In 1995, these three operations recovered a total of 66,571,237 cubic yards of methane gas. The potential for recovering significantly large volumes of methane gas exists, particularly in light of recent federal regulations requiring many landfills to install emission controls.

## CONTROL OF NUISANCE DUMPING AND ILLEGAL DISPOSAL

Nuisance dumping and the illegal disposal of solid waste are considered to be growing and pervasive problems in many areas of Texas. Unfortunately, details on control programs



and the amount of materials being illegally disposed of are not widely tracked.

As an indicator of the extent of the problem, the TNRCC recently completed a survey of county officials in the 32 counties comprising the Texas-Mexico border region,

asking for an assessment of the illegal disposal problems in those counties. In the survey responses, county officials estimated that approximately 1,247 illegal dump sites, both large and small, had been cleaned up by local governments over the previous year. The officials also estimated that more than 20,000 additional sites, primarily smaller nuisance sites, but

also some sites of 10 acres or larger, still remain throughout the border region. Those same officials estimated that it could cost almost \$22 million to clean up all of these sites. Although it would not be appropriate to extrapolate the results of this study on a statewide basis, these figures nonetheless serve as a general indicator of the magnitude of the state's nuisance dumping and illegal disposal problems, and it is clear that dealing with these problems will continue to require significant resources.

Many communities in Texas now have periodic or ongoing local enforcement programs and conduct regular cleanup activities. Many joint community and nonprofit partnerships, such as with the local Keep Texas Beautiful, Inc., affiliates, are focused on preventing litter and illegal disposal. The number of these programs and activities continues to increase.

The state also sponsors a number of statewide education programs and special cleanup activities. The TNRCC has helped to organize several river, lake, and coastal cleanups in various locations, and these types of events are becoming more popular. In addition, the Texas Department of Transportation sponsors the *Don't Mess With Texas* public awareness campaign and the "Adopt-A-Highway" cleanup programs, and the Texas General Land Office maintains highly successful cleanup programs such as the "Adopt-A-Beach" program.



# REGIONAL AND LOCAL SOLID WASTE MANAGEMENT PLANS

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## PLAN DEVELOPMENT

As required in Chapter 363, Texas Health and Safety Code, the 24 COGs in Texas have developed regional solid waste management plans, with funding assistance from the state. Each regional plan was developed according to content and format guidelines established by the TNRCC. All 24 regional plans have been completed and adopted by the TNRCC, and these plans serve as guidance documents for decision-making at the regional and local levels, and assist in statewide planning efforts as well. Figure 6 shows the locations of the 24 solid waste planning regions in the state.

All 24 COGs are currently updating basic data in their regional plans, and this process should be completed soon. These updates do not require any formal action by the TNRCC. However, any subsequent changes to plan goals or recommendations, if needed, would require a formal amendment and re-adoption process.

Although the legislation which requires the development of regional plans also requires the development of local plans, state funding assistance for local plan development has been limited. At this time, three local plans have been completed and two others are still being prepared.

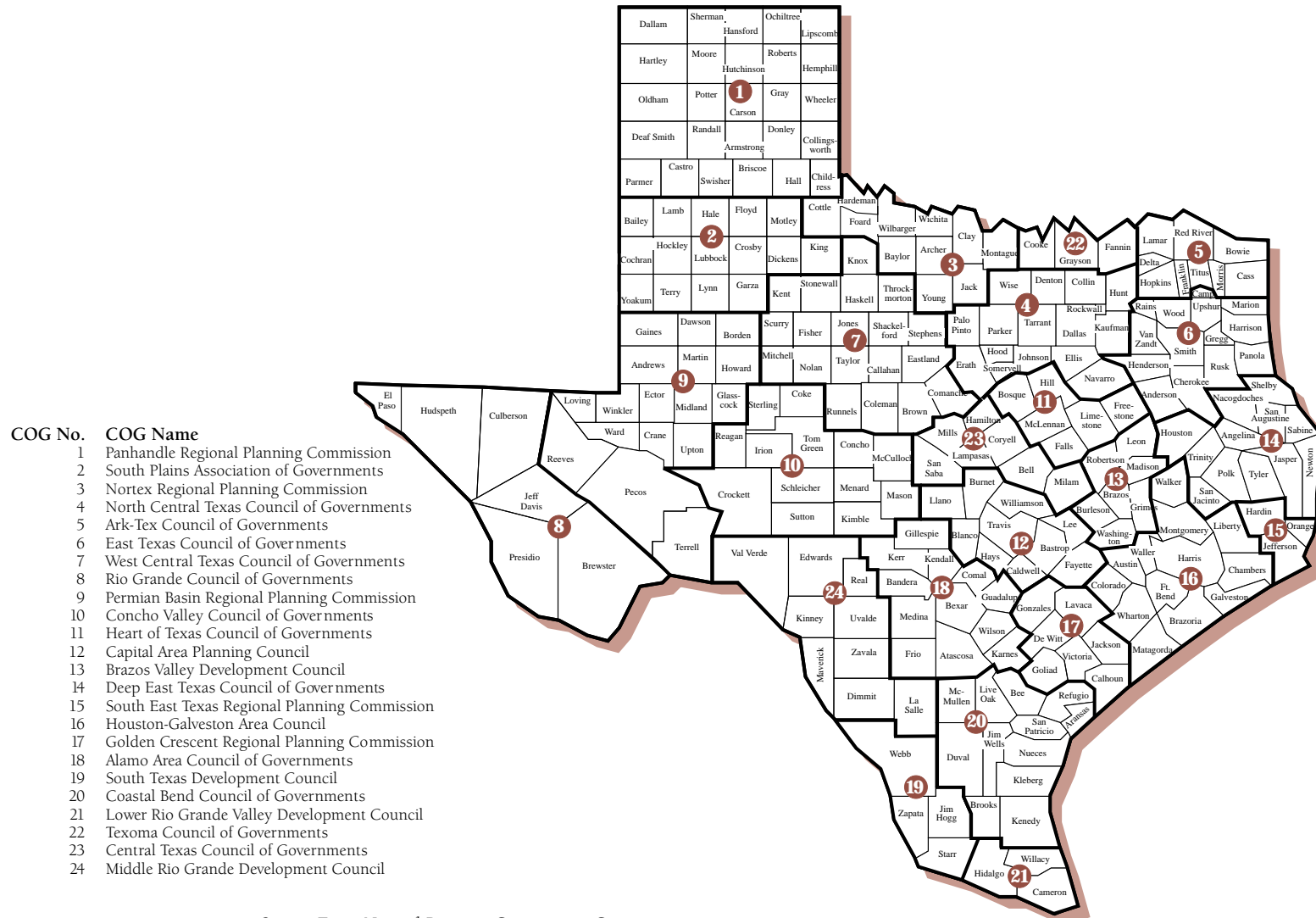
(See Figure 6. *Regional Solid Waste Management Planning Regions in Texas*.)

## REGIONAL PLAN IMPLEMENTATION

A primary mechanism for assisting to implement the adopted regional solid waste management plans is through the regional solid waste grants program administered by the TNRCC. Under the current legislatively directed program requirements, half of the state solid waste disposal fee revenues collected by the TNRCC are to be distributed among the 24 planning regions to support regional plan implementation efforts at the regional and local levels, with funding allocated on a formula basis. As a result, \$10.245 million in grant funding were provided to the COGs in FY 1996, and another \$10.245 million will be provided in FY 1997.

In cooperation with the COGs, the TNRCC developed basic guidelines for the FY 1996-1997 solid waste grants program. At a minimum, each COG program includes the following regional coordination functions:

- administering the regional solid waste pass-through grants;
- maintaining a solid waste advisory committee for the region;
- providing technical assistance and other support services to the region;
- assisting the TNRCC in public outreach and training;

**Figure 6****Regional Solid Waste Management Planning Regions in Texas**

Source: Texas Natural Resource Conservation Commission.

- reviewing solid waste permit applications for conformance with the regional plan;
- maintaining a solid waste information and resource center for the region;
- updating the data and information in the regional plan;
- assisting the TNRCC with an inventory of known closed or abandoned landfills.

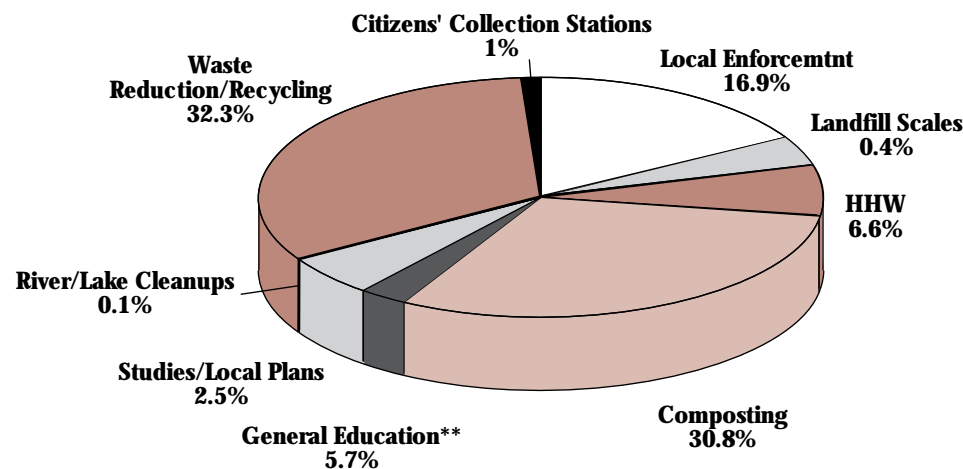
The COGs passed the majority of the grant funds through to support local and regional projects to implement the regional plans. The priority project categories included:

- waste reduction and recycling, including workplace recycling and composting;
- household hazardous waste management;
- local enforcement;
- public education programs;
- installation of scales at landfills;
- citizens' collection stations;
- river and lake cleanups;
- local plans and technical studies (no more than 10 percent of a COG's total annual grant could be applied to local planning projects).

By mid-1996, over 250 implementation projects had been selected for funding by the COGs, accounting for over \$7.5 million of the \$10.245 million allocated to the COGs in FY 1996. A breakdown of funding by various project categories is provided in Figure 7.

The COGs are responsible for submitting a detailed report to the legislature on the FY 1996-1997 solid waste grants program. It is expected that the report will provide quantifiable results of the projects funded through the program.

**Figure 7**  
***FY 1996 Implementation Project Funding, by Category***



Source: TNRCC Solid Waste Grants Program.

\*Also includes chipping, mulching, and "Don't Bag It®" projects.

\*\*Projects in specific grant categories may have educational components of their own.



## **APPENDIX A**

# **STATE WASTE REDUCTION GOAL**

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In 1991, the Texas Legislature set a goal for the state to achieve a municipal solid waste recycling rate of 40 percent by January 1, 1994. In 1993, because of the difficulty in measuring the rate of recycling, the legislature changed the goal to a 40 percent reduction in the amount of municipal solid waste disposed of in Texas, through source reduction and recycling, using 1991 as a base year. The measurement of the goal was to be accomplished by comparing the total number of tons disposed of in the year under comparison to the total number of tons disposed of in the base year, adjusting for changes in population, tons of solid waste imported and exported, and other relevant changes between the baseline year and the comparison year.

The Texas planning statutes (§363.0201, Texas Health and Safety Code) direct that the TNRCC review this goal and make adjustments to the goal as necessary, and include those adjustments in the state municipal solid waste plan. Accordingly, the 1995 *Municipal Solid Waste Plan for Texas* retained the 40 percent reduction goal, but did not establish a specific target date for achievement of the goal. Rather, the plan indicated that a new target date would depend upon the level of additional measures that might be imposed by the legislature.

The 1995 MSW plan also detailed the approach that would be used to measure progress toward achievement of

the goal. Because of the continuing growth in population in the state, it was clear that just measuring the total amount of solid waste entering the state's MSW landfills would not be appropriate, since that total amount may continue to rise, even with more waste reduction measures taking effect. Rather, it was determined that it would be more appropriate to look at the changes in the amount of solid waste being disposed of on a per person, or per capita, basis. It was also determined that the net effect of importation and exportation of solid waste in Texas continues to be essentially insignificant, so the measurement would not need to consider that factor.

Another consideration was the base year for measuring progress. The statutory goal establishes 1991 as the base year for measurement. However, several factors prompted the TNRCC to establish 1992, instead, as the base year for the goal. A primary factor was that many of the state programs for encouraging recycling and other waste reduction activities were established in 1992. Also, improvements were made to the state's reporting forms and procedures, giving more confidence in the figures reported for 1992 and beyond, as well as providing more in-depth information about the wastes being disposed of. Finally, as is shown in this report, 1992 appears to have been a peak year for disposal as measured on a per capita basis, so it seemed more appropriate to base the goal on the peak-year rates.

A final, and important, consideration was to decide whether the measurements would look at all of the solid waste entering the state's MSW landfills, or whether only certain components of the waste stream should be applied to the 40 percent reduction goal. It was discussed earlier that solid waste from both municipal and industrial sources is disposed of in the state's MSW landfills. The solid waste from municipal sources can be further categorized according to the waste generated by typical municipal sources, such as residential, commercial, and institutional wastes, and other wastes, such as construction and demolition debris and municipal sludge.

There were several concerns with trying to evaluate the state's waste reduction progress by categorizing the waste stream components by source and only applying the 40 percent goal to the waste from certain sources. First, it must be understood that the information provided by each landfill concerning the sources of solid waste is, for the most part, only a set of general estimates. Consequently, it is difficult to make definitive conclusions about the increase or decrease in the amount of wastes generated by each source, at least on a short-term, year-to-year basis. Also, the programs of the state to encourage and support waste reduction efforts focus on all of the different activities that generate solid waste in the state, and not just one component. The goal for waste reduction, therefore, applies to all of the different waste components, and not just to those wastes reported as coming from "typical" municipal sources, like residential and commercial wastes.

With these considerations in mind, it was determined that the measurement of the 40 percent reduction goal should be based on the total amount of all solid waste

entering the state's municipal solid waste landfills, using a per capita disposal figure, and comparing the yearly figures with those for 1992. At the same time, the updates to the plan, such as this one, would still show information concerning the various sources and components of solid waste.

It was understood that this measurement approach could cause some confusion and concern at the local level, where many communities have concentrated on measuring the amounts of materials being collected for recycling, rather than trying to determine their disposal rates. There has been some concern expressed by communities that this change in approach may not account for the waste reduction activities that the community already instituted prior to 1992. In addition, some communities may have found it difficult to fully document the amount of solid waste being disposed of from all sources within that community.

In recognition of these concerns, the state waste reduction goal and the proposed measurement mechanisms, while applicable on a statewide basis, should not serve to discourage individual local communities from continuing to document the effectiveness of their waste reduction programs through determining a local recycling rate and other measurements. The TNRCC continues to work with local governments to evaluate the effectiveness of their recycling and waste reduction programs. Each waste-generating sector, whether it be a local community, a business, or an industry, should determine the measurements that best indicate how well it is reducing the amount of solid waste that will eventually end up in the state's landfills.

## **APPENDIX B**

# **REPORTS ON REQUIRED STATEWIDE PROGRAMS**

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### **WASTE MINIMIZATION AND RECYCLING PROGRAMS**

The TNRCC administers a number of waste minimization and recycling programs, with an emphasis on public education and awareness, and provides technical assistance to local governments and businesses. Brief descriptions of several of these programs follow.

**CLEAN TEXAS 2000 Partnerships.** This program was established to recognize businesses, industries, local governments, schools, civic organizations, and citizens conducting at least one environmental project. By mid-1996, there were more than 3,000 recognized partners participating in the program.

**CLEAN CITIES 2000.** This program now includes 57 municipalities, with populations ranging from 51 to greater than a million. These cities have implemented comprehensive environmental programs and are reporting significant reductions in solid waste disposal to landfills as well as related cost savings, and they have received revenues from the sale of recyclables.

**CLEAN TEXAS STAR.** This program began in 1995 and is the largest, most ambitious voluntary commercial recycling program in state history. Members commit to reduce disposal of nonhazardous solid waste by up to 75 percent by the year 2000. They also commit to maximize purchases

of recycled-content products and sponsor or participate in at least one environmental outreach program in their communities. This voluntary program seeks to capture for recycling all of the solid waste produced in the commercial sector.

In Texas, the commercial sector (including businesses, public and private schools, colleges and universities, and nonprofit organizations) generates more than 50 percent of the solid waste sent to landfills. More than 1,400 facilities have requested CLEAN TEXAS STAR membership, and 58 organizations are CLEAN TEXAS STAR partners.

**CLEAN TEXAS Reporter.** This program has produced a syndicated, 12-part video series, the purpose of which is to educate businesses, industries, governments, civic and environmental groups, and individuals on specific waste reduction actions they can take to reduce pollution.

**Governor's Awards for Environmental Excellence.** This program continues to receive tremendous support: a total of 344 nominations were received in 11 different categories in 1996. Since the program began in 1993, 56 awards have been presented.

**Texas Recycles Day.** This is an annual event (each November 15) first organized by the TNRCC in 1994. More than 90 percent of the communities that took part in Texas

Recycles Day 1995 reported increased participation in recycling. As a result of Texas Recycles Day activities, more than 82,000 individuals and businesses pledged to increase recycling efforts (a twentyfold increase from 1994), and 160 recycling events were reported statewide. Of the communities that sponsored special promotional events for Texas Recycles Day, 90 percent noticed increases in recycling participation just one month after the event.

**Texas Waste in Place.** This waste reduction and recycling curriculum was developed by the TNRCC and Keep Texas Beautiful, Inc., (KTB) to provide educational resources for Texas secondary school teachers. Under contract with the TNRCC, KTB trained 2,426 teachers in using the curriculum in 1992 through 1994. More than 3,000 other Texas teachers were trained through other funding sources. According to KTB, more than 2,000 additional teachers received a two-hour “mini-training” course from teachers who had attended the six-hour sessions.

**Teaching Environmental Sciences (TES).** This special training course was created by the TNRCC in 1994 as a way to consolidate environmentally related educational programs, including air, water, and solid waste. The TNRCC works in conjunction with universities to provide the TES course.

**Resource Exchange Network for Eliminating Waste (RENEW).** This waste exchange program, created by the TNRCC, reported that a total of 112,400 tons of material were exchanged in 1995, saving participating companies a total of \$1.2 million. The program facilitates recycling by matching facilities that need materials with other facilities that need to dispose of such materials.

**Centralized Yard Trimmings Management.** The TNRCC provides technical assistance to governmental entities, public and private institutions, and commercial generators to promote centralized processing, including grinding, mulching, and composting of yard trimmings, food scraps, and other materials. Site assessments have been provided to municipal and county operations, military facilities, and county and state prisons. Regional workshops have been held in several locations across the state.

**CLEAN TEXAS 2000 Master Composter Program.** This program promotes on-site or “backyard” composting, a source-reduction strategy for yard trimmings and food scraps. The TNRCC assists cities, counties, councils of governments, and environmental organizations with workshops to teach coordinators and volunteers (master composters) the biology and techniques of composting as well as methods for program promotion and outreach. Since this program started in 1994, 300 citizens from 74 cities have been trained and certified as CLEAN TEXAS 2000 master composters, and have in turn trained an additional 3,000 volunteers.

**Workplace Waste Reduction and Recycling.** This program provides technical assistance and promotion for voluntary waste reduction and recycling practices through direct consultation, training, publications, and special outreach activities for businesses, industries, local governments, state agencies, schools and school districts, universities, military facilities, and trade associations. With as much as 60 percent of the MSW stream generated by the commercial sector, the combination of waste reduction and recycling in the workplace represents the greatest opportunity for diverting



waste from landfills as well as for achieving significant cost savings for businesses and public institutions. In the past year, the TNRCC/Department of Defense P2 Partnership, started through a TNRCC workshop, has become an agent for promoting recycling initiatives at 24 military facilities. A series of school recycling workshops has been conducted in 17 of the state's 20 regional service centers.

**Municipal Solid Waste Management OPTIONS for Texas.** This annual conference offers information and instruction through a waste reduction, recycling, and composting track for representatives for cities, counties, authorities, and special districts.

**Environmental Trade Fair.** The recycling track for this event each year provides information to manufacturers and industrial companies, agencies responsible for management of MSW, and builders and developers on the topics of buying recycled, recycling markets, waste reduction assistance programs, construction and demolition recycling, and voluntary community programs such as Texas river and lake cleanups and household hazardous waste collections.

**Blueprint for 40%.** This training course on comprehensive MSW reduction provides information and instruction in developing effective strategies for addressing waste reduction and recycling. The course has been given in Austin, Lubbock, Beaumont, and San Antonio, training more than 100 recycling coordinators and solid waste management professionals.

Two other state agencies, the Texas General Land Office (GLO) and the Texas General Services Commission (GSC), continue to have a major role in promoting source reduction

and recycling in Texas. A summary of some of the activities of these agencies is outlined below.

The GLO is directed by the legislature to conduct a variety of activities related to waste reduction. Some of the main accomplishments of the GLO include:

- staff support for the Recycling Market Development Board, consisting of representatives from state agencies involved in recycling programs;
- completion of a comprehensive recyclables market development study entitled, *Texas Recycles—Marketing Our Neglected Resources*;
- organizing the Texas Corporate Recycling Council, a nonprofit public-private partnership to promote cooperation in waste reduction and market development;
- coordination of the “Buying into the Loop” conference and trade show to promote recycled goods to public and private sectors;
- regionalized coalition development, which offers assistance to communities in recycling and buying recycled;
- “E-Source,” an on-line database and bulletin board system with information on recycling;
- conducting regionalized “Buy Recycled” workshops.

The GSC provides state agencies with standard guidelines for recycled-content materials that are available under state contract. The GSC maintains an Internet information page of procurement-related information on recycled, remanufactured, and environmentally sensitive products,

listing more than 2,700 items, to assist governmental entities in purchasing such products.

### **RECYCLING BY GOVERNMENTAL ENTITIES**

The TSWDA directs that all governmental entities in the state (i.e., state agencies, state courts or judicial agencies, university systems or institutions of higher education, counties, municipalities, school districts, and special districts) are to establish recycling programs for the materials generated through their operations. Such entities are also to give preference in purchasing to products made of recycled materials.

There is no direct requirement for governmental entities to report on their establishment of internal recycling programs; therefore, no comprehensive estimates are available on the extent to which this requirement has been implemented. The GSC did receive reports from 165 state agencies and universities in 1994, indicating that 78 percent of those responding have instituted recycling programs. The GSC reported that purchases of recycled, remanufactured, and environmentally sensitive products increased significantly in 1994, totaling \$51,966,235, as opposed to the 1993 total of only \$24,000,000. Information on the compiled results of reports by state agencies in 1995 is not yet available.

### **NEWSPRINT RECYCLING**

The TSWDA includes a program to encourage newspaper publishers to promote recycling through the purchase of recycled products, and cooperating with local community organizations to establish and promote community collection

efforts for all paper products. The goals established for the use of recycled newsprint by newspaper publishers were:

- 10 percent by the end of 1993;
- 20 percent by the end of 1997;
- 30 percent by the end of 2000.

Based on the results of the TNRCC's annual newsprint survey, an estimated 20 percent of newsprint purchased in Texas in 1995 had a recycled content of 25 percent or greater. This means that Texas newspaper publishers have reached the goal established for the end of 1997, two years ahead of schedule. Also, while the price received for old newspaper (ONP) in 1996 has leveled at prices lower than those received in 1995, most communities throughout Texas are still able to find relatively strong markets for their ONP.

Publishers responding to a TNRCC survey reported purchases of 662,422 metric tons of newsprint in 1995. Of that amount, 132,442 metric tons had recycled content. Increased public education on issues related to waste reduction and recycling, along with cooperation like that demonstrated by the publishing industry, will likely keep the recycled content of newsprint increasing in Texas.

### **WASTE TIRE RECYCLING PROGRAM**

The TNRCC administers the waste tire recycling program created by the legislature in 1991. This program is funded by a fee on the sale of new tires (however, certain large tires are exempt). The objectives of this program are to:

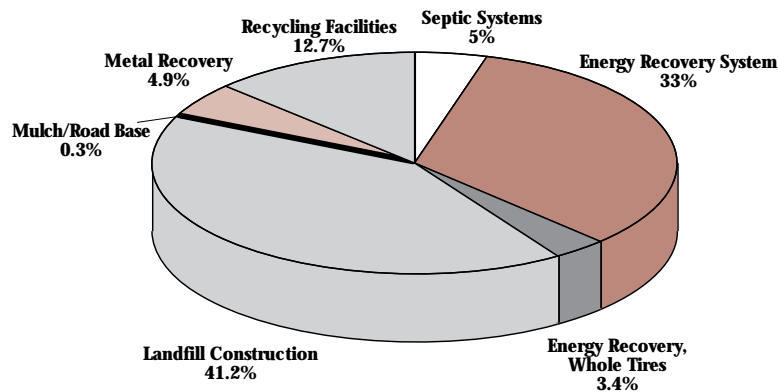
- clean up illegal waste tire sites;
- collect waste tires directly from new tire dealers;

- reduce the number of tires going to landfills for disposal;
- provide a mechanism to recycle, reuse, or recover the energy from used tires.

Scrap tire recycling in Texas was negligible in 1992 when the program was implemented. As the result of the legislation to divert tires from landfills and provide incentives for recycling, the annual rate of recycling has increased to about 72 percent of the tires generated in Texas. Figure B.1 shows the major markets for the use of scrap tires in Texas, which are energy recovery, civil engineering applications, metal recovery, and the manufacture of rubber products.

Civil engineering applications accounted for the largest increase in scrap tire recycling markets during the

**Figure B.1**  
**Major Markets for Scrap Tire Use in Texas**



FY 1995/1996 biennium. Tire shreds can be substituted for gravel in landfill construction, septic system installation and road building. Additional steps the TNRCC has taken to promote recycling efforts include reducing MSW tipping fees on a portion of the waste collected by landfill operators who use tire shreds as part of the drainage layer protective cover or final cover in cell construction; amending the rules for on-site sewage facilities (OSSF) to allow the use of tire shreds as a substitute material for drain fields; and partnering with TxDOT to research suitable road construction projects that will use tire shreds from nearby stockpiles. Uses in road construction include applications as embankment fill, drainage layer medium, sub-base grade material, and mulch.

Thus far, the program has identified over 900 illegal waste tire sites, 600 of which have been remediated. The remaining sites are targeted for remediation. In addition, the program has registered over 13,500 waste tire generators, 385 transporters, 26 processors, and 21 storage sites. As indicated in Table B.1, since 1992 the program has collected more than 118 million weighed tire units (WTUs<sup>1</sup>) and provided over \$98 million in reimbursements to recyclers and processors.

<sup>1</sup>WTU = 18.7 pounds  
of tires or tire shreds

**Table B.1**  
**WTR Program Summary**

| Program Indicator | FY 1992     | FY 1993      | FY 1994      | FY 1995      | FY 1996      |
|-------------------|-------------|--------------|--------------|--------------|--------------|
| Reimbursements    | \$6,921,098 | \$26,522,432 | \$22,449,197 | \$22,185,258 | \$19,939,488 |
| WTUs collected    | 8,142,468   | 31,202,861   | 26,410,820   | 27,850,304   | 25,323,983   |

## **USED-OIL AND OIL FILTER RECYCLING PROGRAM**

In 1991, the Texas Legislature passed the Used Oil Collection, Management, and Recycling Act. This law banned the landfilling and dumping of used motor oil, and created a state used-oil recycling program. Legislation in 1995 also prohibited the disposal of used oil filters.

The legislature directed the TNRCC to conduct an education program to inform the public of the need for, and the benefits of, the collection and recycling of used oil. These programs are funded by a fee on the sale of motor oil in Texas. The main objectives of the TNRCC programs include:

- maintaining a used-oil information center to provide materials and information;
- encouraging the voluntary establishment of used-oil collection and recycling programs;
- conducting a grant program to assist in setting up collection centers for oil from do-it-yourselfers (DIYs);
- encouraging local governments to procure recycled oil or oil blended with recycled oil.

Thus far, the program has registered 2,594 used-oil collection centers, 573 DIY-only used-oil collection centers, and 1,538 used-oil-filter collection centers. In 1995, 4.8 million gallons of used oil were collected by registered collection centers.

## **HOUSEHOLD HAZARDOUS WASTE COLLECTION AND RECYCLING**

The TNRCC is tasked by the legislature to develop standards for household hazardous waste (HHW) diversion programs, such as collection facilities or waste collection days for municipalities, counties, or regions. TNRCC conducts a variety of programs to support the collection and recycling of HHW, some of which are outlined below.

- There are currently several permanent public HHW collection facilities operating in Texas, located in Austin, Corpus Christi, Odessa, New Braunfels, Abilene, and San Antonio.
- In 1995, 48 HHW collection events were held by 30 local governments, collecting more than 1,292,102 pounds (646 tons) of waste from 22,977 participants.
- An additional 126,926 gallons of paint, 6,664 lead-acid batteries, and 35,147 gallons of used oil were collected for recycling at these events during 1995.

The TNRCC also conducts a program called the Texas Country Cleanup Program, designed to extend the same recycling opportunities available in urban areas to rural and agricultural communities. The results of this program in 1995 were as follows:

- 3,503 participants;
- 177,238 plastic and metal pesticide containers collected;
- 53,746 used tires collected;
- 75,107 gallons of used oil collected;
- 100,362 used oil filters collected;
- 10,810 lead-acid batteries collected.

## **APPENDIX C**

# **RECYCLING CAPACITY AND MARKETS IN TEXAS**

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During the latter half of 1994 and most of 1995, demand for recyclables increased in Texas. Most of the increased demand was for various grades of recovered paper, although demand also increased for some recycled plastics.

During 1995, shortages of some grades of recovered paper and plastics led to record prices being paid for these grades of materials. Unlike other raw material markets, the supply of available recovered material cannot be easily expanded to meet an unexpected increase in demand. For example, even though many market analysts had correctly projected increased demand for old corrugated containers (OCC) during 1995, because of a number of new mills coming on line at about the same time as a sudden surge in export orders, the demand for OCC could not be met. As new mills started operation and as existing mills tried to maintain inventories, a severe shortage occurred. For four months in a row, the price being paid for OCC increased more than 20 percent per month; however, even these dramatic increases could not satisfy demand.

Conversely, during 1996, the supply of both OCC and old newspaper (ONP) have exceeded demand. As the panic buying of 1995 subsided, unpredictable export orders dried up, the economy softened, and demand dropped. Those

collecting the materials, especially local governments that collect recyclable materials as part of their waste collection operations, were not able to cut back on the supply to balance with demand, so they were left with a stock of recyclable materials for which they may have had trouble finding a market. This situation during 1995 and 1996 did not mean that the capacity is not available to deal with the paper collected in Texas. Instead, it pointed to the fact that timing and market demands fluctuate according to changing conditions, and the local governments and others collecting materials will need to enact mechanisms to deal with these fluctuations.

Recent studies of Texas' recycling markets suggest that, for most of the major materials being collected for recycling, barriers and problems with maintaining an efficient recycling system lie in factors other than there being sufficient end uses and end-use capacity for that material. In 1994, the TNRCC contracted with Mt. Auburn Associates, Inc., and Hazen and Sawyer, P.C., to prepare a market development study for Texas recyclables. Their findings suggested that for five of the major types of materials collected for recycling—paper, non-green glass, steel cans, plastics, and used oil—the current “primary” barriers to market development lie outside the realm of demand.

The question of markets, therefore, is more complex than just whether there is capacity available to handle the materials collected for recycling. In just about all cases, sufficient end use capacity exists to deal with the materials available from Texas. It would not be possible to include a complete outline in this report of all the data and information concerning the status of markets for materials in Texas. The reader is, therefore, encouraged to obtain a copy of the 1994 market development study, as well as the R. W. Beck and Associates study, *1991 Recycling Rate and Market Research* (Texas Water Commission, 1993), and the reports prepared by the Texas General Land Office, *Texas Recycles—Marketing Our Neglected Resources* (GLO, December 1992) and *Texas Recycles 2—Marketing Our Neglected Resources* (GLO, October 1994). Summary information for selected materials examined in the market development study as well as the other reports is presented below.

### ***Steel Cans***

Scrap consumers in Texas could use up to about 329,000 metric tons of steel can scrap annually. This amount is almost 100 times greater than the reported 1991 recycling levels of 3,698 short tons (about 3,338 metric tons). There is ample ability of end users in Texas to absorb additional supplies of recycled steel cans in the foreseeable future. The barriers to additional steel-can recycling appear to be more on the supply side, including lack of collection programs for steel cans. Other related issues include the poor preparation of food cans, which leads processors or end users to reject materials or reduce the price paid, and

an unwillingness or inability of primary processors to invest in processing equipment (such as balers).

### ***Glass***

The findings of the report were that there appears to be a consensus that if more glass were available at a reasonable proximity to the processing and manufacturing facilities, the state's container manufacturers would eagerly absorb the expanding supply of glass being collected. Low prices and high transportation costs, however, have affected the viability of collection and processing of much of the glass in Texas. Problems with mixed-color cullet and contaminants have also served to reduce the prices paid by the end users for the glass collected for recycling.

### ***Paper***

Texas is not a key paper-producing state; it consumes 250 percent as much paper as it produces. Less than half of the paper recovered in the state is actually used by Texas mills. Within the state, there are currently two paper mills that utilize OCC, one mill that de-inks ONP, another that utilizes OCC, ONP, and mixed papers, and several building products manufacturers that consume OCC, ONP, and mixed papers. There is currently not a large in-state market for office paper grades, although Neches Fiber in Beaumont plans to construct a de-inking mill to produce recycled pulp from office papers. Also, two newsprint mills have announced plans to locate in Texas, each planning to use a large volume of ONP.

The out-of-state capacity for utilizing recyclable paper, including the capacity in Mexico, appears to be sufficient to

handle the paper being recovered in Texas. Recent market price fluctuations notwithstanding, the 1994 market report found that, other than for mixed paper, lack of demand was not the critical barrier to market development. ONP markets appeared to be constrained by a lack of supply, while OCC and high-grade office paper are constrained by lack of processing capacity, especially in rural areas. Importantly, local communities operating recovery programs need more consolidated, cooperative arrangements and sufficient facilities to deal with short-term fluctuations in market prices.

### ***Plastics***

Texas is a leading plastics-manufacturing state, and the 1991 Beck study suggested that almost all of the recovered plastics in the state are utilized by Texas end users. The Beck study noted that more than 900 businesses in the United States handle or reclaim postconsumer plastics, and that Texas has between 25 and 30 of these. In addition, the GLO report listed 71 Texas companies that may be able to provide a market for Texas plastics.

The issue with recycling market demand, therefore, is primarily related to price. The willingness of industry to use recovered plastics does not mean an increase in demand, as the prices those industries are willing to pay are too low for many communities to make an investment in operations to collect plastics. The cost to collect, sort, bale, transport, and prepare the materials for reprocessing is high compared to the price received for the material.

### ***Compost***

The 1992 GLO report indicated that the potential amount of compost that could be used or sold in Texas far exceeds the potential amount that could be produced. The GLO study cited an estimate that between 300,000 and 400,000 cubic yards of compost are sold in Texas each year. A 1992 national study conducted for the Composting Council estimated that the potential demand for compost in Texas exceeded 98,102,269 cubic yards. Many of the end uses that would make up this potential demand, however, are yet to be fully developed. Thus, an impediment to compost markets is having the viable end uses in place to create the demand for more compost. The viability of composting operations is also a very regional issue, since transportation costs would preclude the establishment of single-location statewide markets for compost.

This summary information is by no means a complete description of the status of markets for recyclables in Texas. For the most part, however, the key to Texas markets is understanding that recycling will need to be viewed as a business, with fluctuations in demand and price. Local governments that collect materials for recycling must view their operations accordingly.

There is sufficient market capacity in Texas to support continued advances in waste reduction efforts. Many of the problems that will need to be overcome are more related to collection and processing, and the prices received at those stages of the process, than the ability of end users to utilize the materials that could be generated by Texas for recycling.





# ***APPENDIX D***

## ***PER CAPITA DISPOSAL RATE AND DISPOSAL CAPACITY SCENARIOS***

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Future per capita disposal rates and disposal capacity will depend on a number of factors, none of which can be predicted with absolute certainty. Population growth will be the primary factor, but the extent of waste reduction efforts, economic conditions, and regulatory requirements will also be very important in shaping the future of solid waste management in the state.

It is beyond the scope of this report to consider all of the possible factors that could affect the future of solid waste management in Texas, but three different scenarios for future conditions are provided based on population growth and extent of waste reduction efforts. It is assumed that state population will continue to grow at the same rate in each scenario (of the various population estimation methods applied by the Texas State Data Center, one has been chosen for this purpose based on the 1990-1994 migration pattern). However, each scenario assumes a different extent of waste reduction efforts; it will be this factor that decision-makers at the state, regional, and local levels will be able to influence most directly.

Each of the three scenarios is described below, with resulting disposal rates and effects on capacity summarized in Table D.1. Each scenario uses 1992 as the base year for comparison. Further, each scenario assumes that the resulting

per capita disposal rate will level off after the year 2000. Although each scenario assumes no additions of disposal capacity, realistically it is expected that the permitting of new landfills and expansions to existing facilities will for the most part be able to keep up with losses in capacity due to attrition and closures.

**Scenario 1:** Waste reduction efforts would not go beyond those in place in 1995, and the per capita disposal rate would remain constant at 6.5 pounds per day.

**Scenario 2:** Waste reduction efforts would continue at their current pace, such that a 20 percent reduction in the per capita disposal rate would be achieved by the year 2000.

**Scenario 3:** Waste reduction efforts would exceed their current pace, such that a 40 percent reduction in the per capita disposal rate would be achieved by the year 2000.

Scenario 1 assumes that no advances in current waste reduction efforts would occur, and the state would fail to attain even a 20 percent reduction in the per capita disposal rate. Such a scenario could involve cuts in current programs. Scenario 2 assumes that waste reduction efforts would advance at a moderate rate, as they are currently, achieving a 20 percent reduction in the per capita disposal rate. Scenario 3 would attain the legislature's 40 percent goal, but it would require significant advances in waste reduction efforts.

**Table D.1****Per Capita Disposal Rate and Disposal Capacity Scenarios**

| <b>Year</b>  | <b>1992</b>       | <b>1993</b>       | <b>1994</b>       | <b>1995</b>       | <b>2000</b>       | <b>2005</b>       | <b>2010</b>       | <b>2020</b>       |
|--|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| <b>Population</b>  | <b>17,655,650</b> | <b>18,031,484</b> | <b>18,378,185</b> | <b>18,645,153</b> | <b>20,320,434</b> | <b>22,072,935</b> | <b>23,954,503</b> | <b>28,322,845</b> |
| <b>Scenario 1: No Advances in Waste Reduction Efforts Beyond 1995</b>              |                   |                   |                   |                   |                   |                   |                   |                   |
| <b>Tons disposed of</b>  | 21,675,661        | 21,517,063        | 21,808,274        | 22,125,068        | 24,113,022        | 26,192,609        | 28,425,351        | 33,608,996        |
| <b>Pounds/person/day</b>   | 6.72              | 6.53              | 6.50              | 6.50              | 6.50              | 6.50              | 6.50              | 6.50              |
| <b>Capacity (tons)</b>   | 440,730,048       | 456,161,796       | 483,752,966       | 461,627,917       | 345,062,609       | 218,307,257       | 80,724,940        | 0                 |
| Remaining capacity reaches zero in 2013.   |                   |                   |                   |                   |                   |                   |                   |                   |
| <b>Scenario 2: Achieve a 20% Reduction in the Per Capita Disposal Rate by 2000</b> |                   |                   |                   |                   |                   |                   |                   |                   |
| <b>Tons disposed of</b>  | 21,675,661        | 21,517,063        | 21,808,274        | 21,489,619        | 19,957,751        | 21,678,973        | 23,526,958        | 27,817,333        |
| <b>Pounds/person/day</b>   | 6.72              | 6.53              | 6.50              | 6.31              | 5.38              | 5.38              | 5.38              | 5.38              |
| <b>Capacity (tons)</b>   | 440,730,048       | 456,161,796       | 483,752,966       | 462,263,366       | 359,203,912       | 254,291,649       | 140,418,176       | 0                 |
| Remaining capacity reaches zero in 2016.   |                   |                   |                   |                   |                   |                   |                   |                   |
| <b>Scenario 3: Achieve a 40% Reduction in the Per Capita Disposal Rate by 2000</b> |                   |                   |                   |                   |                   |                   |                   |                   |
| <b>Tons disposed of</b>  | 21,675,661        | 21,517,063        | 21,808,274        | 20,726,603        | 14,968,313        | 16,259,229        | 17,645,219        | 20,862,000        |
| <b>Pounds/person/day</b>   | 6.72              | 6.53              | 6.50              | 6.09              | 4.03              | 4.03              | 4.03              | 4.03              |
| <b>Capacity (tons)</b>   | 440,730,048       | 456,161,796       | 483,752,966       | 463,026,382       | 376,184,067       | 297,499,870       | 212,094,765       | 18,428,905        |
| Remaining capacity reaches zero in 2021.   |                   |                   |                   |                   |                   |                   |                   |                   |

Sources: Population estimates from the Texas State Data Center. Disposal data from TNRCC annual MSW facility reports.

# ***APPENDIX E***

## ***REGIONAL DISPOSAL DATA***

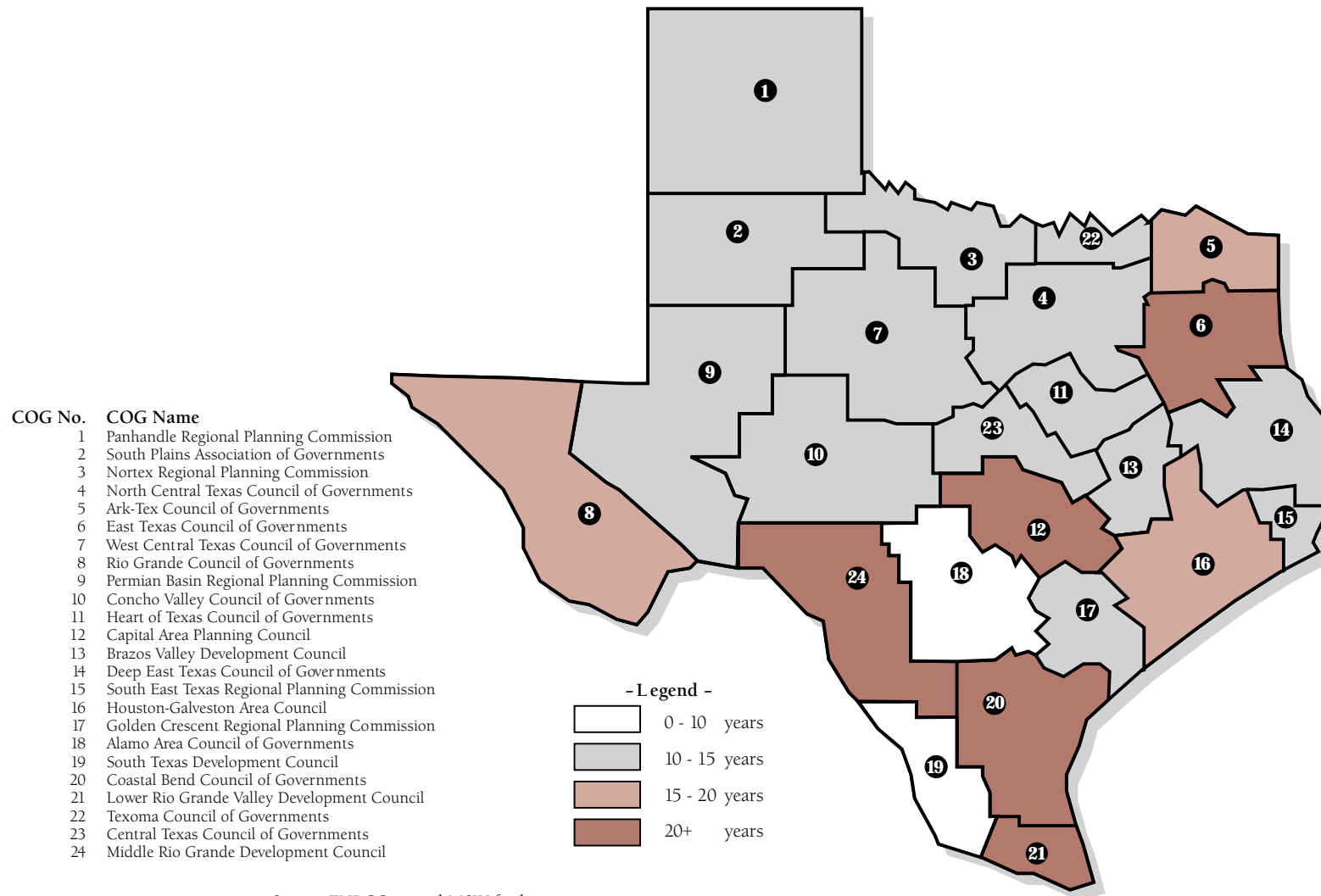
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The 24 councils of governments (COGs) in the state are officially designated as solid waste management planning regions. Figure E.1 shows that the total available disposal capacity in the state in 1994 was not distributed evenly among these 24 regions. Although the state as a whole enjoys a relatively large reserve of landfill space, some regions in the state are definitely not as well off as others. The statewide average disposal capacity is 22.2 years, but there are three regions with less than half of this reserve available: East Texas, Alamo Area, and South Texas. Table E.1 provides more detailed regional data.

Of the largest metropolitan areas in the state, the San Antonio and Houston areas have the smallest reserves of landfill space. Although, as indicated in Table E.1, the Greater Houston Area had 41 open MSW landfills in 1994, it is important to note that 20 of these landfills were Type IV facilities, which are only permitted to accept C&D debris, brush, and other nonputrescible materials. In the case of the San Antonio area, it is important to note that if the city of San Antonio were not under a long-term contract to send a portion of its solid waste to a large, private landfill in the Austin area, the landfill space currently available in the San Antonio area would not last as long as indicated in Table E.1. The other large metropolitan areas in the state, including Dallas, Fort Worth, and Austin, have comparatively larger reserves of landfill space available.

As indicated in Table E.1, there is a wide variance in per capita disposal rates among the 24 planning regions in the state. Although these differences are certainly driven by population density and climate (i.e., wetter areas tend to generate more vegetative waste), they are also attributable to the growing fact that waste flows do not necessarily follow political boundaries. In other words, even though a certain region may have very successful waste reduction programs, if it also imports solid waste from other regions, its per capita disposal rate will not tend to show the extent of decrease expected. On the other hand, those regions that export solid waste to other regions will tend to have lower per capita disposal rates, irrespective of the extent of their waste reduction efforts. Consequently, evaluating the statewide average per capita disposal rate provides a better picture of overall waste reduction efforts in Texas, particularly since the state as a whole neither imports nor exports very much MSW.

As shown in Figure E.2, the MSW landfills currently open in Texas are not distributed evenly throughout the state. For the many counties that have no landfills at all, transportation of solid waste has become a major concern; in some of the more sparsely populated areas of the state, it may be more than 50 miles to the nearest landfill. Although this is largely considered to be a West Texas phenomenon, it should be noted that Deep East Texas, with a higher average population density, also has very few landfills.

**Figure E.1****Disposal Capacity in Texas by Planning Region (COG), 1994**

Source: TNRCC annual MSW facility reports.

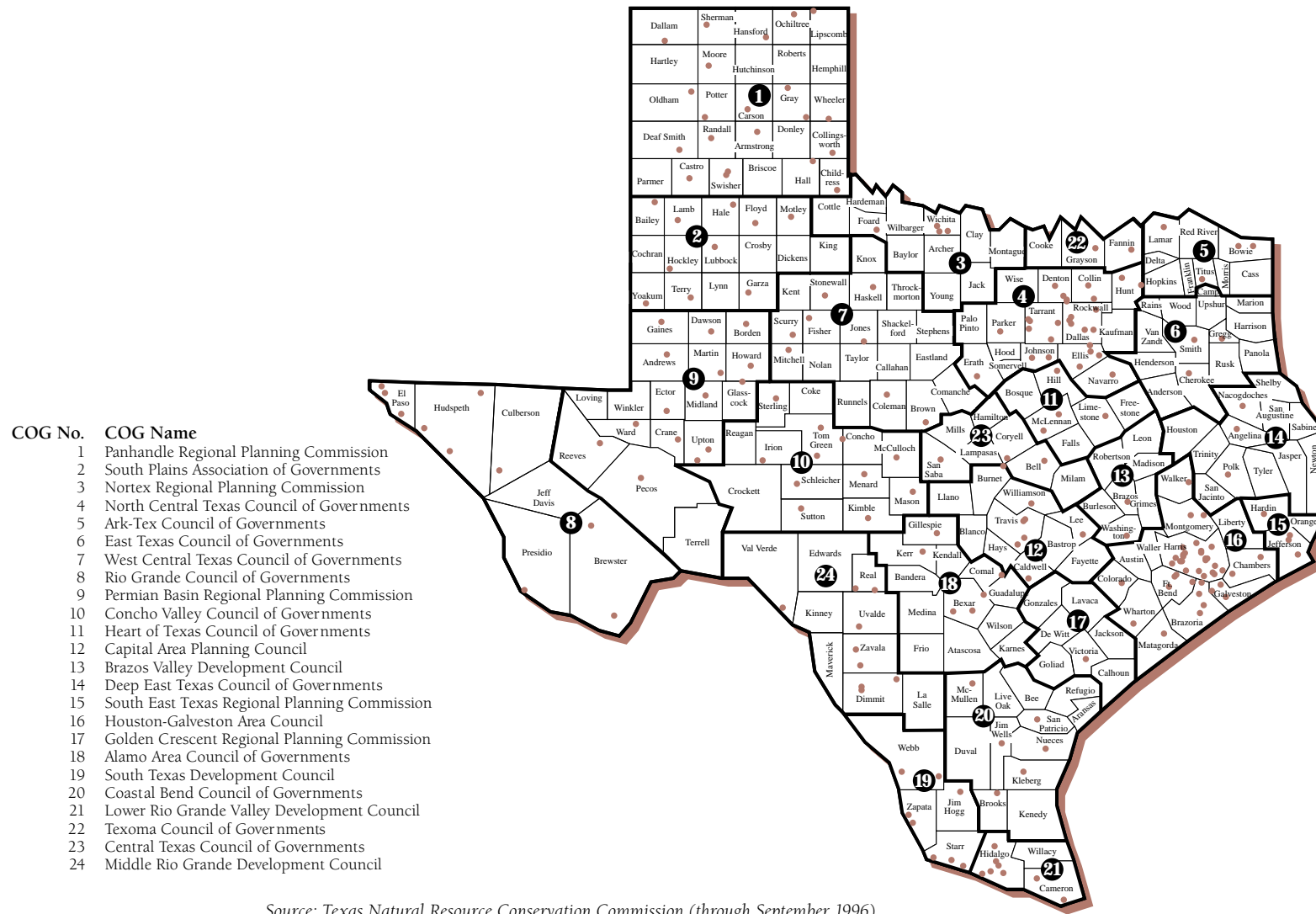
**Table E.1**

**Analysis of Solid Waste Disposal in Texas by Planning Region (COG), 1994**

| Region        | MSW Landfills* |              | Disposal          |              |              | Remaining Capacity |              |             |
|---------------|----------------|--------------|-------------------|--------------|--------------|--------------------|--------------|-------------|
|               | Number         | % Total      | Tons              | % Total      | Per Capita** | Tons               | % Total      | Years       |
| 1             | 26             | 10.1         | 429,005           | 2.0          | 6.1          | 25,853,290         | 5.3          | 60.6        |
| 2             | 11             | 4.3          | 388,509           | 1.8          | 5.7          | 14,360,445         | 3.0          | 38.7        |
| 3             | 5              | 1.9          | 218,915           | 1.0          | 5.6          | 4,390,444          | 0.9          | 21.1        |
| 4             | 32             | 12.4         | 6,222,162         | 28.5         | 7.7          | 140,850,574        | 29.1         | 22.7        |
| 5             | 4              | 1.6          | 274,649           | 1.3          | 5.9          | 5,245,719          | 1.1          | 19.4        |
| 6             | 3              | 1.2          | 558,026           | 2.6          | 4.5          | 5,918,838          | 1.2          | 10.7        |
| 7             | 11             | 4.3          | 340,686           | 1.6          | 5.8          | 28,224,524         | 5.8          | 86.0        |
| 8             | 9              | 3.5          | 349,712           | 1.6          | 2.8          | 6,795,019          | 1.4          | 20.0        |
| 9             | 20             | 7.8          | 411,612           | 1.9          | 5.9          | 30,009,719         | 6.2          | 73.1        |
| 10            | 14             | 5.4          | 136,111           | 0.6          | 5.2          | 11,228,110         | 2.3          | 82.5        |
| 11            | 5              | 1.9          | 356,760           | 1.6          | 6.6          | 9,207,323          | 1.9          | 25.9        |
| 12            | 8              | 3.1          | 1,542,060         | 7.1          | 8.2          | 50,499,637         | 10.4         | 32.9        |
| 13            | 2              | 0.8          | 169,268           | 0.8          | 3.0          | 4,962,656          | 1.0          | 29.5        |
| 14            | 3              | 1.2          | 206,372           | 0.9          | 3.5          | 5,586,050          | 1.2          | 27.5        |
| 15            | 4              | 1.6          | 516,394           | 2.3          | 7.5          | 12,692,988         | 2.6          | 24.8        |
| 16            | 41             | 15.9         | 5,688,652         | 26.1         | 7.3          | 74,730,603         | 15.4         | 13.1        |
| 17            | 2              | 0.8          | 114,556           | 0.5          | 3.6          | 4,178,963          | 0.9          | 36.7        |
| 18            | 9              | 3.5          | 1,966,863         | 9.0          | 6.7          | 20,213,422         | 4.2          | 10.6        |
| 19            | 8              | 3.1          | 201,088           | 0.9          | 4.9          | 1,987,562          | 0.4          | 9.9         |
| 20            | 10             | 3.9          | 538,227           | 2.5          | 5.6          | 6,557,179          | 1.4          | 12.5        |
| 21            | 10             | 3.9          | 573,540           | 2.6          | 4.1          | 7,717,198          | 1.6          | 13.9        |
| 22            | 4              | 1.6          | 187,419           | 0.9          | 6.7          | 4,168,765          | 0.9          | 22.2        |
| 23            | 4              | 1.6          | 281,169           | 1.3          | 4.5          | 6,589,021          | 1.4          | 24.5        |
| 24            | 12             | 4.6          | 136,519           | 0.6          | 5.1          | 1,784,937          | 0.4          | 13.1        |
| <b>Totals</b> | <b>257</b>     | <b>100.0</b> | <b>21,808,274</b> | <b>100.0</b> | <b>6.5</b>   | <b>483,752,986</b> | <b>100.0</b> | <b>22.2</b> |

Source: TNRCC annual MSW facility reports.

\*Includes both active and inactive facilities. \*\*Disposal rate in pounds per person per day.

**Figure E.2****MSW Landfills Currently Open in Texas**

Source: Texas Natural Resource Conservation Commission (through September 1996).

(Includes active and inactive permitted landfill sites.)



Texas Natural Resource Conservation Commission  
Office of Waste Management/MC 132  
P.O. Box 13087  
Austin, TX 78711-3087